

Total Number of Pages: [02]

Total Number of Questions: [07]

Course Title: Geotechnical Engineering-I
Course Code: CEL 2061

Time Allowed: 3.0 Hours

Max Marks: [50]

Instructions/Note

- i. Attempt All Questions.
- ii. Support your answer with neat freehand sketches/diagrams/ graph, wherever appropriate.
- iii. Assume an appropriate data / information, wherever necessary / missing

15

Assume $G=2.7$.

| Properties of soil sample | Undisturbed | Remolded |
|------------------------------|-------------|----------|
| Strength (kN/m^2) | 244 | 144 |
| Water content (%) | 22 | 22 |
| Liquid limit (%) | -- | 45 |
| Plastic limit (%) | -- | 20 |
| Shrinkage limit (%) | -- | 12 |
| % passing no. 200 sieve | -- | 90 |

Q4.

Explain the principle of the direct shear test. with neat diagram. What are the advantages of this test? What are its limitations?

[06]

CO4

Q5.

A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeability of these layers are: $8 \times 10^{-4} \text{ cm/s}$, $52 \times 10^{-4} \text{ cm/s}$, and $6 \times 10^{-4} \text{ cm/s}$, and their thicknesses are 7 m, 3m and 10 m respectively. Find the effective average permeability of the deposit in the horizontal and vertical directions.

[06]

CO2

Q6.

A homogeneous earth dam has a top width of 6 m and a height of 42 metres with side slopes of 3 (horizontal) to 1 (vertical) and 4 (horizontal) to 1 (vertical) on the upstream side and downstream side respectively. The free board is 2 m. There is a horizontal filter at the base on the downstream side extending for a length of 60 m from the toe. The coefficient of permeability of the soil is $9 \times 10^{-2} \text{ mm/s}$. With the help of flow net, find the quantity of seepage per day for 100 metre length of the dam.

[06]

CO2

Q7.

When an undrained triaxial compression test was conducted on specimens of clayey silt, the following results were obtained:

| Soil sample | 1 | 2 | 3 |
|----------------------------------------------------------|-----|-----|-----|
| Chamber pressure (kN/m^2) | 80 | 150 | 210 |
| Max deviator stress (kN/m^2) | 175 | 240 | 300 |
| Pore pressure at max deviator stress (kN/m^2) | 45 | 50 | 60 |

With the help of Mohr circle, determine the values of shear parameters considering (a) total stresses and (b) effective stresses.

[10]

CO4

Course Outcomes

Students will able to:

- CO1. Find the index and engineering properties of the soil.
- CO2. Determine properties & demonstrate interaction between water and soil.
- CO3. Analyze and compute principles of compaction and consolidation of soil.
- CO4. Evaluate the stresses in the soil mass.

| CO | Questions Mapping | Total Marks | Total Number of Students (to be appeared in Exam) |
|-----|-------------------------|-------------|---------------------------------------------------|
| CO1 | 1(a), 3(a) | 5 | 59 |
| CO2 | 1(b), 1(c), 1(d), 5 & 6 | 15 | 59 |
| CO3 | 1(e), 2(a), 2(b) & 3(b) | 13 | 59 |
| CO4 | 1(f), 4 & 7 | 17 | 59 |